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AEROSPACE INDUSTRIES ASSOCIATION

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Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
445 12th Street SW
12th Street Lobby, Counter TW-A325
Washington, DC 20554

Re: Ex Parte Notice: In the matter of the Authorization and Use of Software Defined Radios
ET Docket 00-47

Dear Ms. Salas:

The Aerospace Industries Association of America ("AIA") hereby notifies the Commission that members of AIA's Space Council (including representatives from Harris Corp., Raytheon Corp., and Boeing), met on Thursday, February 15, with members of the International Bureau regarding the above-captioned proceeding. The purpose of this meeting was to discuss, in general, the current technology in the field of software defined radios.

Respectfully Submitted,

Bruce Mahone

Bruce Mahone
Aerospace Industries Association
Director, Space Policy

cc: Donald Abelson, International Bureau
Tom Tycz, International Bureau
Ron Repasi, International Bureau
Karl Kensinger, International Bureau
Chris Murphy, International Bureau

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AGENDA

AIA Space Council/FCC Emerging and Advanced Technologies Briefing
Federal Communications Commission
Room 7B516
445 12th Street SW
Washington, DC 20554
February 15, 2001

Software Defined Radios

Introduction	Bruce Mahone- Aerospace Industries Association
The Harris Corporation Perspective	Mark Turner- Harris Corporation
The Raytheon Corporation Perspective	Philip Eyermann- Raytheon Corporation
Question and Answer Session	Mark Turner- Harris Corporation Philip Eyermann- Raytheon Corporation Dick James- Boeing Co.

Possible Future Topics

Rad Hard Electronics
On-Board Processing
Satellite Swarms

AIA Meeting on Software Defined Radios
2-15-01

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Aerospace Industries Association/Federal Communications Commission Advanced Technology Briefing Series

Emerging and Advanced Technologies

Software Defined Radios

Presented by Aerospace Industries Association Space Council

February 15 , 2001

AIA/FCC Advanced Technology Briefings

- Background and reasoning behind the advanced technology briefing concept
- Benefits
  - FCC
  - Industry
- Future Topic Areas

Emerging and Advanced Technologies

During each technology briefing we will aim to discuss:

- **The current technology and capability**
- **State of the art or breakthrough technology**
- **Impact on satellite capability/adaptability/ performance**
  - **Secondary benefits**
- **Capability insertion timeline**

Software Defined Radio (SDR) Briefing

Harris Corporation

Software Defined Radio

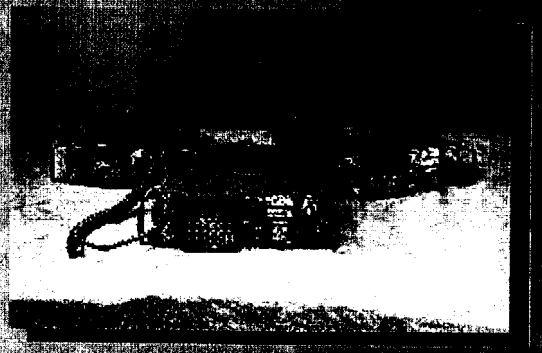
- Emerging software based radio technology
- Radio software re-programming offered hardware platforms.
  - I.e., technology insertion, capability upgrades
- Facilitates waveform application portability across different vendor's hardware platforms
- Applies to Government, Military and Commercial domains.
  - Rate of incorporation driven by market sector economic benefits.

Software Defined Radio Benefits

- Reduced time to market with lower acquisition and operational costs.
  - Leverages software component reuse
  - Opens market to third party software applications
  - Supports parallelism in development activities
- Extends hardware platform life cycle, reduces product supportability costs.
- Enables Engineering resources to focus on highly leveraged development tasks.

Harris - An SDR Pioneer

- 1988: RF-5000 vehicular and base-station HF radio is delivered by Harris is first military SDR.
- 1992: AN/PRC-138 radio moves SDR technology to HF/VHF man-portable platforms.
- 1996: ***FALCON™ II*** family of HF/VHF/UHF radios leverages new technology, furthers SDR.
  - Marriage of radio and computer.
  - Re-programmable hardware.
  - Run-time reconfiguration.



Leveraging Technology for SDR

- Division between hardware/software will continue to migrate based on today's technology trends.
- ***FPGA technology*** provides re-programmable and reconfigurable hardware implementations.
- Advanced ***DSP technology*** used for high speed signal processing, increased data rates.
- ***Object-oriented software technology*** increases **software reliability, reuse reduces** time to market.
- ***Programmable cryptography technology*** provides security updates over product life cycle.

Government and Military Markets

- Joint Tactical Radio System (JTRS)
  - "U.S. Military program to acquire a family of affordable, high-capacity, tactical radios to provide interoperable LOS/BLOS C4I capabilities to the warfighter."
  - Harris JTRS Phase 2B contract to test and validate JTRS software architecture.
  - Develop, install and test JTRS software in AN/PRC-117F(C) manpack radio.

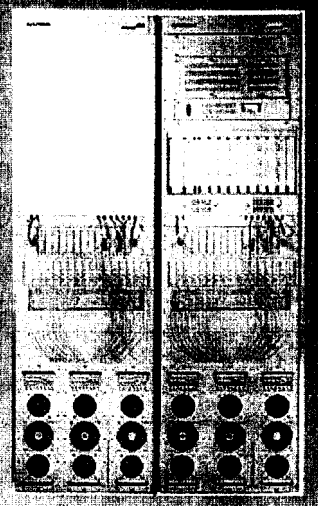
- High performance SATCOM applications
- Civil Aviation applications: VHF data link (VDL)
- Secure Law Enforcement wireless applications

Commercial Market

- Software Defined Radio Forum (SDRF)
  - International body of industry, Government and academia that promotes development and application of open architecture, reconfigurable wireless technology.
  - John Fitton, Sr. Scientist at Harris is chair of the Applications Sub-Working Group.

- Microwave Systems: Pt-to-Pt, Pt-to-Multipoint applications.

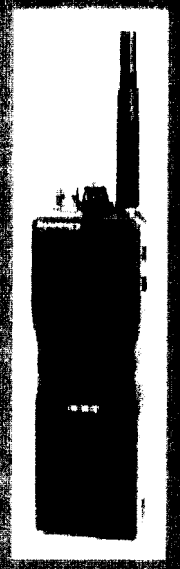
- Wireless Local Loop applications.



Conclusions

–Harris is a Software Defined Radio [illegible] and has a significant strategic interest [illegible] continuing evolution of SDR

- **Military, Government <u>and</u> Commercial Markets**
- Lower development costs through standardization and scalability across different platform types
- Lower product life cycle costs by extending radio hardware life span.
- Reduced time to market through software reuse, parallel development activities



Software-Defined Radios

Raytheon Corporation

February 2001 Briefing on Emerging
and Advanced Technologies

Software-Defined Radio Background

- A fully software-defined radio allows run-time reprogrammability, growth, application portability and extension, etc. without hardware limitations
  - e.g. control performance characteristics by geographic or political region, offer flexible spectrum usage options
- Enabled by technology advances
  - Hardware (e.g. processing capabilities, smart antennas)
  - Software (e.g. Java, XML, CORBA)

Hardware Capabilities

- Currently available processing power supports all-software radios from baseband/IF (intermediate frequency)
- 'Smart' RF technologies allow software control of hardware front-end performance
- Technology moving to ever smaller, faster devices
  - able to trade performance for lower power consumption / heat dissipation
  - higher performance analog to digital converters move software radio closer to antenna

JTRS Software Communications Architecture

- CORBA and XML based software framework definition provides
  - independence from hardware & operating systems
  - application program interfaces (APIs) defined for common services
  - communications application portability
  - adaptability to specific user needs
  - structure conducive to technology insertion
- Goal to become commercially supported industry standard

Software Capabilities

- Adoption of advanced higher order languages increases functionality and portability/reuse
  - Java, XML, CORBA middleware
- Standards groups pulling industry together
  - Object Management Group advancing CORBA technologies
  - Software Defined Radio Forum defining common architectures
  - Widespread industry support for Java & XML advancement

Where Are We Today?

- Software defined radios are available today, typically as proprietary, point solutions
- Improved technologies and adoption of open architectures will expand their use
- Regulatory bodies can encourage or stifle full implementation of their promise (threat?)
  - can we defined the fine line of control to satisfy regulatory needs without negating the opportunities offered?

BOEING

Joint Tactical Radio System

JTRS Enables Information Superiority in the Battlespace

The Boeing Company JTRS solution premieres the next generation software defined information and communications architectures

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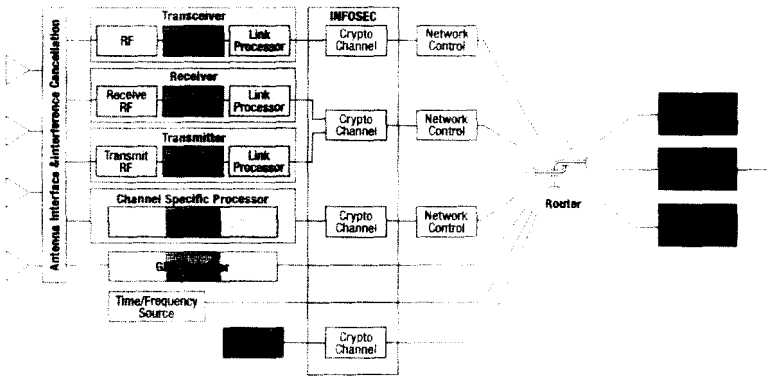

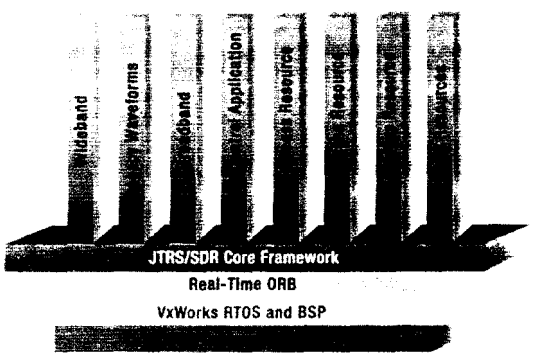

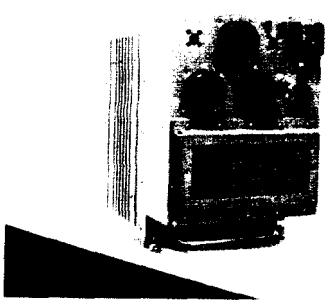

Non-proprietary Core Framework
- Community Open Source License
- Seamless integration of information management and communications applications
- Legacy waveform applications

Network Centric Architecture
- Key enabler for the GIG

Wideband Internetworking
- Peer-to-peer, mobile ad-hoc
- Extended, IP-based routing capabilities
- Data, voice, video and sensor support
- Quality of service extensions
- Flexible, variable data rates
- Optimized links in dynamic frequency, bandwidths and terminal power levels
- Satellite communications

Secure Environment
- Multi-channel encryption
- Excellent performance under interference, jamming, multi-path and fading conditions
- Enables future protocols

Maximum use of COTS products
- Scaleable across a multitude of mobile and fixed environments
- Upgradeable as component industry performance improves

Minimal impact to platform integration
- Easily extendable across multiple platform configurations
- Legacy interfaces maintained

Parameter	Implementation
Number of Channels	4
Bandwidth	30 MHz
Frequency Range	2-2000 MHz
INFOSEC	Multi-channel Crypto
I/O	1553
Waveform	Wideband Networked, Legacy
SCA	V 2.0
Form Factor	cPCI 3/4 ATR

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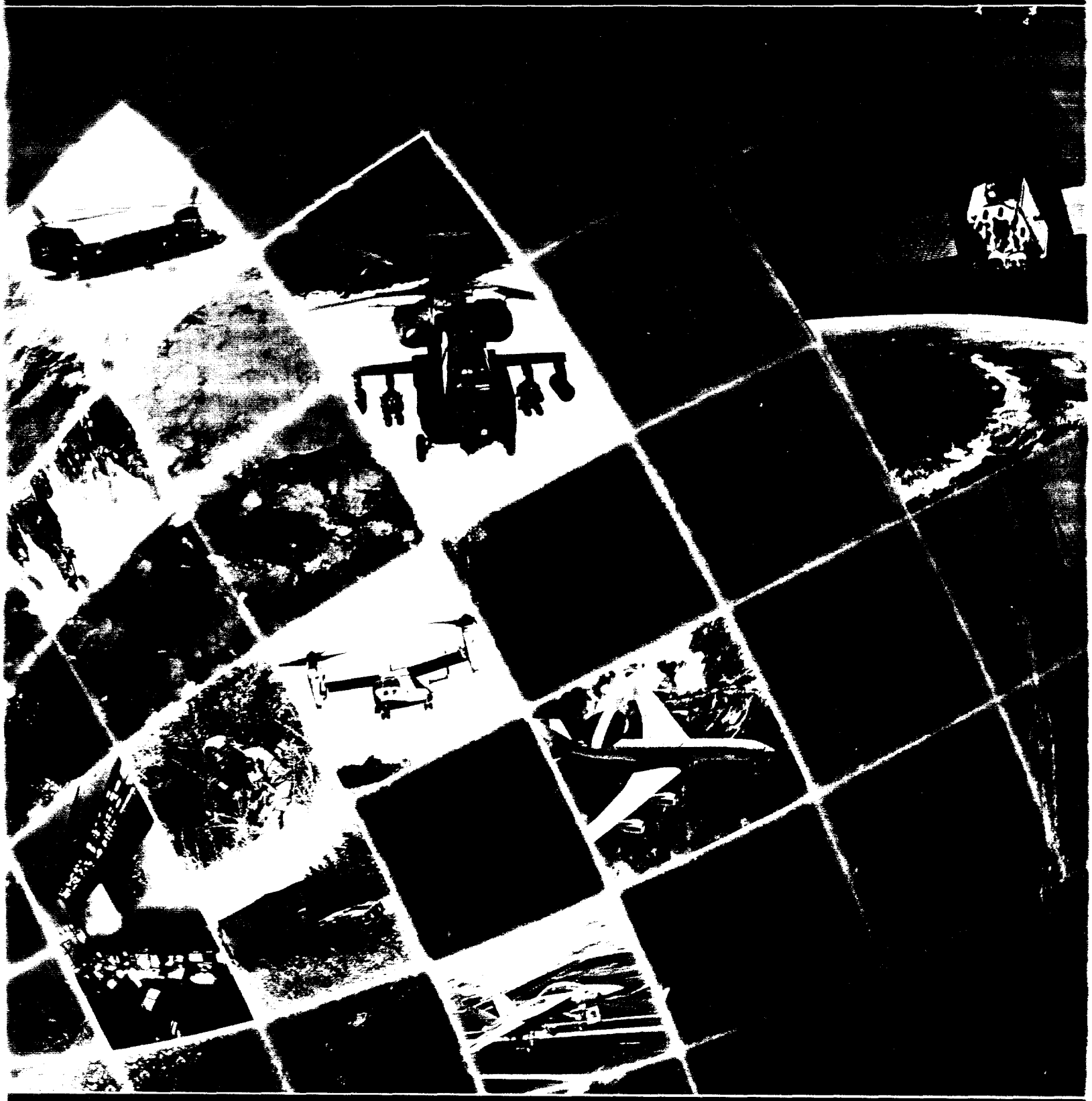

Joint Tactical Radio System

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